UCRL-JC-124371 Abs

Abstract Submitted
for the DPP96 Meeting of
The American Physical Society

Sorting Category: 4.5 (theoretical)

Laser Energy Deposition Model for the ICF3D Code

THOMAS B. KAISER, JACK A. BYERS, *University of California, Lawrence Livermore National Laboratory* — We have built a laser deposition module for the new ICF physics design code, ICF3D[1], being developed at LLNL. The code uses a 3D unstructured grid on which hydrodynamic quantities are represented in terms of discontinuous linear finite elements (hexahedrons, prisms, tetrahedrons or pyramids). Because of the complex mesh geometry and (in general) non-uniform index of refraction (*i.e.*, plasma density), the geometrical-optical ray-tracing problem is quite complicated. To solve it we have developed a grid-cell-face-crossing detection algorithm, an integrator for the ray equations of motion and a path-length calculator that are encapsulated in a C++ class that is used to create ray-bundle objects. Additional classes are being developed for inverse-bremsstrahlung and resonance-absorption heating models. A quasi-optical technique will be used to include diffractive effects. Development of our module has been greatly simplified by use of the ICF3D Python shell, a very flexible interface that allows command-line invocation of member functions.

[1]"3D Unstructured Mesh ALE Hydrodynamics with the Upwind Discontinuous Finite Element Method," D. S. Kershaw, M. K. Prasad and M. J. Shaw," LLNL Report UCRL-JC-122104, (1995)

☐ Prefer Oral Session
☒ Prefer Poster Session

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Date submitted: June 21, 1996 Electronic form version 1.1

This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under contract No. W-7405-Eng-48.